The relationship between the Nature and the Society: GIS "Disasters"

Marina Vikulina[1], Alla Sergeevna Turchaninova[1], Anna Dolgaya[2], Alexander Vikulin[2], *ELENA PETROVA[1]

1. Lomonosov Moscow State University, Faculty of Geography, 2.Institute of Volcanology and Seismology

The natural and social disasters generate a huge stress in the world community. Most researches searching for the relationships between different catastrophic events consider the limited sets of disasters and do not take into account their size. This fact puts to doubt the completeness and statistical significance of such approach. Thus the next indispensible step is to overpass from narrow subject framework researches of disasters to more complex researches.

In order to study the relationships between the Nature and the Society a database of natural disasters and dreadful social events occurred during the last XXXVI (36) centuries of human history weighted by the magnitude was created and became a core of the GIS «Disasters» (ArcGIS 10.0). By the moment the database includes more than 2500 most socially significant ("strong") catastrophic natural (earthquakes, fires, floods, droughts, climatic anomalies, other natural disasters) as well as social (wars, revolts, genocide, epidemics, fires caused by the human being, other social disasters) events. So far, each event is presented as a point feature located in the center of the struck region in the World Map. If the event affects several countries, it is placed in the approximate center of the affected area. Every event refers to the country or group of countries which are located in a zone of its influence now. The grade J (I, II and III) is specified for each event according to the disaster force assessment scale developed by the authors. The GIS with such a detailed database of disastrous events weighted by the magnitude over a long period of time is compiled for the first time and creates fairly complete and statistically representative basis for studies of the distribution of natural and social disasters and their relationship.

By the moment the statistical analysis of the database performed both for each aggregate (natural disasters and catastrophic social phenomena), and for particular statistically representative types of events led to the following conclusions: natural disasters and dreadful social events have appeared to be closely related to each other despite their apparently different nature. The numbers of events of different magnitude are distributed by logarithmic law: the bigger the event, the less likely it happens. For each type of events and each aggregate the existence of periodicities with periods of 280 ±60 years was established. The identified properties of cyclicity, grouping and interaction create a basis for modeling essentially unified Geosocial Process at a high enough statistical level and prove the existence of the uniform planetary Geosocial Process. The evidence of interaction between "lifeless" Nature and Society is fundamental and provided a new forecasting approach of demographic crises taking into account both natural disasters and social phenomena. The idea of the interaction of Nature and Society through the disasters «exchange» as a uniform planetary Geosocial Process is an essentially new statement introduced for the first time.

Keywords: geodynamics, society, magnitude of disaster, interaction of disasters, geosocial process

Modeling of Information Flow for Early Warning in Mount Merapi Area, Indonesia

*LeslieJamie Cajipe Cobar[1], Djoko Legono, Kuniaki Miyamoto[1]

1.University of Tsukuba

Indonesia's Mount Merapi is one of the world's most active, dangerous volcanoes. Its 2010 eruption -- the largest following the 20th century -- and succeeding 2011 lahar events killed 389 persons and injured and displaced many more. One way to mitigate a disaster's impact on its potential victims is to provide the public with reliable information through early warning. Warning information must reach down to the community levels. However, little research has been done on the contents of warning information flowing from the monitoring and forecasting institutions to the public. For Merapi's early warning, the routes of information from monitoring and forecasting agencies down to the citizens was studied by Rahardjo in 2007, yet the contents of information itself was not understood. This study reinvestigated Merapi's early warning information flow down to the citizens by conducting interviews among stakeholders to collect the data received and from which stakeholder, data sent and to which stakeholder, and the method of delivery. The sender-data-receiver as the basic unit of information transfer was introduced for the construction of information flow networks. In terms of information flow networks, it was necessary to construct individual networks for eruption and lahar per local government district due to the complexity of structures. Among the districts, inconsistencies in relation to past and current network structures for both disasters and in each district, roles of institutions, decision-making for issuance of evacuation order, and monitoring sources were found. Information transfer redundancies and vulnerabilities such as bottlenecks and decision-making issues were also revealed. These issues could offer a new point of view on early warning information delivery for Merapi's disasters.

Keywords: information, early warning, Merapi, eruption, lahar

The Great East Japan Earthquake's Impact to Human Society as Described in Haiku

*yoji aoki[1], Miyako Koyama, Shunji Ito[2], Kinuko Jambor[3], Kazuo Shibata

1.The open University of Japan, 2.Haiku club Minato, 3.Haiku International Association

1. Introduction
The magnitude 9.0 earthquake occurred on March 11, 2011, had severe impact on human society by the destruction of huge mass of living areas and taking away many lives. The psychological effects resulting from this disaster are still ongoing. The destruction of coastal settlements in Kesennuma has lost not only people but also their psychological support by the community. Before the earthquake, people made their living with rich bounty of sea and nature, the earthquake and tsunami left a deep sorrow and ineffable pain (Aoki, Fujita and Kumagai 2014). Even one or two years after, many people are yet suffering with serious injuries. When cherry blossom bloomed on damage trees fired, when the fish were landed in reconstructed fish markets, when volunteers and victims deepened their ties, people found their hope and were continuing to move forward, although still irritated in slow progress of reconstruction in the disaster areas. A great deal of reconstruction has already begun, but it will take longer time to complete it (photo). The current bustle of the city is caused by the activities of the migrant construction workers and their vehicles. A large amount of capital has been invested, but no one knows how long this will continue. After this investment end, people should resume daily life with a focus on tourism and fisheries.
In order to record this impact of disaster, poets conducted a haiku meeting in Kesennuma Ocean on July 29, 2012 in the affected areas Kesennuma, and collected 1752 haiku from inland and abroad (Kesennuma Haiku Association 2012). And the July 28, 2013, they collected 1734 haiku. Many volunteers and donation promoted this haiku meeting (Kesennuma Haiku Association 2013). Here, we describe the impact left in the haiku.

2. Method of Study
Generally, understanding of haiku will be differed by the knowledge of the disaster and the taste of haiku selection. So, we employed two types of respondents, e.g. respondents of the disaster area and respondents of other areas. They read the haiku and counted the number of disaster haiku.

3. Results
In 2012, respondents of disaster area selected 635 haiku (Table 1) by more than one person. But 123 of these haiku were not selected by the respondents of other areas. On the other hand, other areas selected 600 haiku by more than one person, but 94 of those haiku were not selected by disaster area. So the selection of disaster haiku was different by the area. This showed the different knowledge among areas on the disaster. And there are many haiku selected by only one respondent (Table 2). This showed the difference among individual knowledge on the disaster. In 2013, the disaster area selected 370 haiku by more than one person, other areas selected 423. Since total numbers of haiku in two years has no big difference, the disaster haiku was reduced within a year. Selected haiku mostly showed the tragic events, but some showed pleasure of landing of bonito.

4. Statistical analysis
From 2012 to 2013, the percentage of haiku composed by the disaster was decreased at the statistical significance level of 0.01 in all respondents (Table 3). Haiku recognized as to be composed by the disaster was decreased in all level (Table 4).

5. Detailed comparison of appreciation among respondents
Generally, variety of the appreciation on haiku was formed by their experiences of disaster and their taste of haiku. Although some variety will exist, more than 10 persons selected the same haiku. In 2012, they selected 109 haiku and 28 in 2013. So we can say disaster haiku was found in

this experiment. Those haiku were listed in table 5 and 6.

Keywords: haiku, effect of disaster, emotional damage

Subsidence hazard assessment and mapping around underground space considering the angle of collapse

*Jin Son[1], Hyeong-Dong Park[1]

1.Seoul National Univ.

As the human activities in underground area increased in order to enhance the land use, the number of ground subsidence occurrences are also escalating. It is observed not only domestically but also globally that the ascending trend in both pecuniary losses and casualties where the ground foundation is unstable. Analyzing and mapping the ground subsidence hazards in advance is one of the most essential process. GIS (Geographical Information System) is powerful tool for quantitative estimation and display of ground subsidence hazards on regional sites. In recent studies, it is popular that conducting statistic approaches on hazard assessments using GIS. The objective of this research is to design the analysis model to assess subsidence hazard adopting the triggering factors within the radius of influence. The radius of influence can be calculated with the spatial analysis algorithm, which is mainly concerned with the angle of collapse, and allocated to each underground cavity. Ground subsidence inventory obtained by Korea Expressway Corporation and Mine Reclamation Corporation are applied to training stage of frequency ratio analysis, which identifies the degree of each triggering factor. The whole analysis stages are designed as a spatial analysis module to automate the whole process. As a result, the ground subsidence hazard map is composed to display the risk level of target site. It is supposed that this analysis can help in decision-making stage for the reinforcement and urban planning.

Keywords: Ground subsidence, Hazard assessment, Hazard mapping, GIS

Microclimatic characteristics of three different urban districts
in a context of more frequent and intense heatwaves

Didier Soto[2,1], Lucie Merlier[3], *Florent Renard[1], Frédéric Kuznik[4], Lucille Alonso[1]

1.University Jean Moulin Lyon 3, UMR 5600 CNRS Environment City Society, 2.Labex IMU –Université de Lyon, 3.UMR 5008 CETHIL –INSA de Lyon / EDF BHEE, 4.UMR 5008 CETHIL –INSA de Lyon

Located in the south-eastern part of France, the territory of the Greater Lyon consists in 59 communes covering an area of 524 square kilometres and housing a population of about 1.3 million. First signs of climate change have taking the form of a rise in average annual and seasonal temperatures and the number of very hot days, indicating that heatwaves can be considered as the main hazard to deal with. If the Greater Lyon has been fully involved for ten years in the national effort for a local reduction of greenhouse gases, the local adaptation policy is still being developed. It is up against several scientific obstacles in particular local climate measurement. To address this issue, this study proposes the first results of a multidisciplinary research at the crossroads between engineering sciences and humanities. It is now well known that characterising heat-related risk needs to identify the spatial components of the urban heat island phenomenon, which may amplify the impacts of coming heatwaves on citizens and urban systems (Romero-Lankao et al., 2012). A first mesoscale approach is currently led covering the whole Greater Lyon using remote-sensing and computer modelling but it does not allow to ensure an in-depth knowledge of the local microclimates.

As a first step to solve this problem, a map of human vulnerabilities has been displayed as an early result from a vulnerability index (Renard et al., 2015). This allowed identifying the most vulnerable urban districts of the Greater Lyon, which generally correspond to high density residential areas with rather different urban morphologies. Three different districts with high vulnerability values have been retained : "Lyon-Terreaux", in the historic old city ; "Lyon-Perrache", an ancient suburb in full renovation and "Rillieux-Semailles" in the residential suburbs.

A characterization of the related microclimate is completing this approach to evaluate the corresponding exposure in these three districts. Microclimatic simulations are currently performed using "SOLENE-microclimat" model, developed by the CRENAU Laboratory from the Nantes School of Architecture (Musy et al., 2015). This model has been chosen because of its capacity to take into account radiative transfers, conduction and storage in walls and soils, airflow and convective exchanges, evapotranspiration from natural surfaces (vegetation, water ponds, humidification systems) and the energy balance. A recent enhancement allows now its coupling with Code-Saturne Computer Fluid Dynamics (CFD) for a more accurate characterisation of local microclimates in terms of surface temperature, air temperature and velocity.

First results and analysis highlight some urban properties that significantly influence the local microclimatic conditions and human comfort, and which are especially challenging for urban planning, in a context of more frequent and intense heatwaves. Effects of urban morphology are especially stressed, while this factor may also be related to social and economic trends.

Musy, M., Malys, L., Morille, B., Inard, C., 2015. The use of SOLENE-microclimat model to assess adaptation strategies at the district scale. *Urban Clim.*, 14, Part 2, 213–223.
Romero-Lankao, P., Qin, H., Dickinson, K., 2012. Urban vulnerability to temperature-related hazards: A meta-analysis and meta-knowledge approach. *Glob. Environ. Change*, 22, 670–683.
Renard F., Soto D., Alonso L., 2015. Identification et répartition spatiale des personnes vulné rables àla chaleur dans la métropole de Lyon. Congrès annuel de la Société Française de Santé et

d'Environnement (SFSE), Paris, p. 61

Keywords: microclimatic, urban district, urban heat island, heat waves